347
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BIOLOGICAL EVALUATIONS OF THREE DOUGLAS-FIR TUSSOCK MOTH INFESTATIONS IN NORTHERN IDAHO

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By
Scott Tunnock, Entomologist

U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
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Region 1

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INTRODUCTION

Epidemics of the Douglas-fir tussock moth, Hemerocampa pseudotsugata McD., have occurred periodically in northwestern states since 1927. An infestation of major importance covered 500,000 acres of Douglas-fir and true-fir forests in northern Idaho, northeastern Oregon, and eastern Washington during 1947. This epidemic was brought under control by aerial sprays of DDT.

The Forest Service, Region 1, was not bothered by the moth again until 1955. That summer, considerable defoliation occurred in northeastern Washington. By 1956, the epidemic subsided from natural causes in all forested areas.

In 1961, Mr. Roland Portman, Extension Entomologist, Idaho, reported that Douglas-fir, grand fir, and ornamental spruce trees near farms and private homes were being heavily defoliated in Moscow, Clarks Fork, and Bonners Ferry, Idaho. Infestations in and around Clarks Fork and Bonners Ferry were surveyed from the air and later inspected on the ground during August by personnel from the Division of State & Private Forestry. Nine infested trees were located within the Clarks Fork and most of them were mature grand firs. North and south of Bonners Ferry nine groups of infested trees, totaling about 36 trees, were found. These groups were mixtures of the three species of trees mentioned above. About 40 trees, mostly spruce, were reported to have been defoliated in the Moscow area.

Nearly 50 percent of the infested trees in and near Bonners Ferry, and about 90 percent of them in Moscow were sprayed during the summer of 1961.

The tussock moth infestations within the three cities were re-examined during December 1961. Collections of moth cocoons were taken from each area and brought back to Missoula for analysis.

METHODS

Cocoon samples were obtained by hand picking from the lower limbs of host trees or by pole pruners from the upper limbs. Many cocoons were collected from the

bottom sides of boards or logs beneath infested trees. When sheds were near infested trees, cocoons could be found attached to the underside of eaves. A collection of at least 100 cocoons was desired from each infested spot.

Cocoons were examined for egg masses, adult emergence, and opened to determine pupal mortality. Female Douglas-fir tussock moths are wingless. When a female moth emerges from her cocoon she crawls to its top surface. After being fertilized by a male, she lays eggs on the cocoon in a frothy mass mixed with body hairs. Cocoons from which winged male moths emerge have no eggs on them (fig. 1).

RESULTS

The number of current egg masses compared with the number from previous years has been used as a guide for predicting the trend of Douglas-fir tussock moth infestations.[1/] As an epidemic increases, new egg masses greatly outnumber old ones. Trends for the three infestations in Idaho, based on data from Table 1 that pertains to percentages of current egg masses and mortality, are listed below:

Locality of infestation	Percentage of total egg masses that were current	Percentage of pupae killed	Probable infestation trend for 1962
Clarks Fork	89	37	Increasing
Moscow	17	37	Decreasing
Bonners Ferry	95	28	Increasing

The infestation was greatly reduced in Moscow because most of the moths were killed by DDT before they laid eggs.

Female moths were slightly more abundant then males in the three areas, and Dipterous parasites were found inside pupae more often than Hymenopterous ones (table 1).

1/ Dodge, H. R., 1956. An analysis of Douglas-fir tussock moth cocoons - Winter of 1955-56--With reference to the trend of the current outbreak in eastern Washington. Unpublished report of the Forest Insect Laboratory, Intermountain Forest and Range Experiment Station, Forest Service, USDA, Missoula, Montana. (Processed.)

DISCUSSION

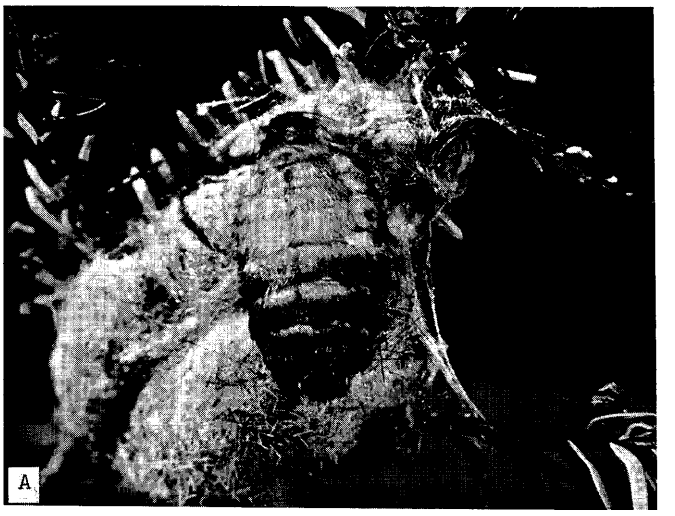
Defoliation of ornamental trees around farms and homes in Moscow, Bonners Ferry, and Clarks Fork by the Douglas-fir tussock moth will probably continue for several more years. These infestations can be reduced by spraying the foliage of trees with DDT as soon as the larvae begin to feed in the spring.

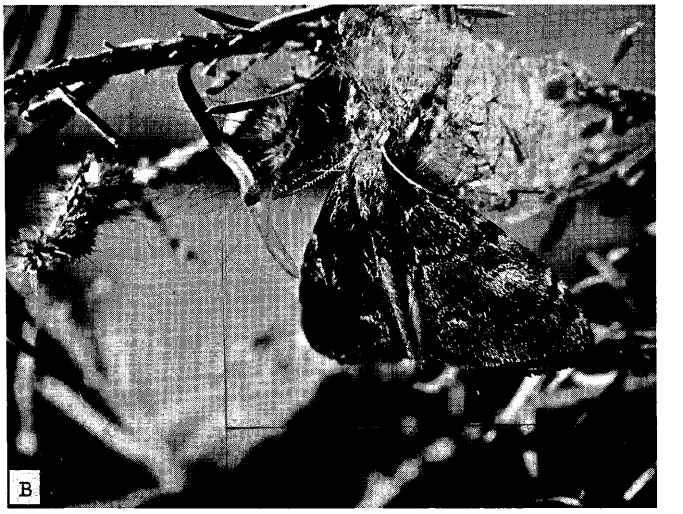
Windstorms can carry young larvae many miles, and in some areas the infestations may spread to surrounding forests. Defoliation in forested areas is usually less intense because of constant decimation by natural enemies which are more scarce about farms and homes (Dodge, 1956). These forested areas will be checked for new infestations of the moth next year.

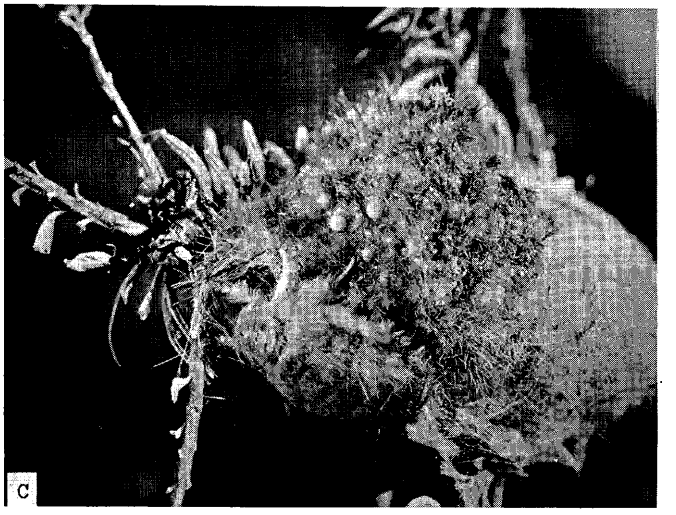
Table 1.--Results from examinations of Douglas-fir tussock moth egg masses and cocoons collected in northern Idaho during December 1961.

Cocoon collecting areas	Pupae in cocoons: Successfully emerged*		Pupae in cocoons: Killed by			Total no. of cocoons examined	Cocoons bearing egg masses	
	Male	Female	Diptera	Hymenoptera	Other agents		1961	Older
Clarks Fork	56	61	23	5	40	185	54	7
	30%	33%	12%	3%	22%	-	89%	11%
Moscow	90	101	5	3	102	301	17	84
	30%	33%	2%	1%	34%	-	17%	83%
Bonners Ferry	144	262	43	31	84	564	248	14
	26%	46%	8%	5%	15%	-	95%	5%

*Cocoons from which females emerged have eggs on them, male cocoons are naked.







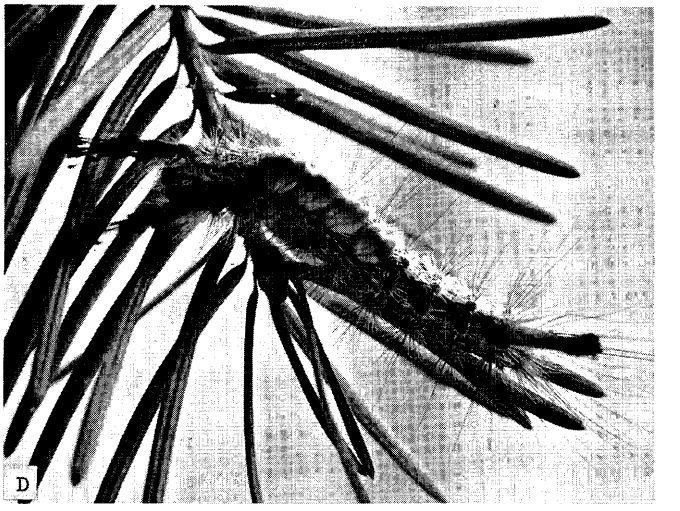


Figure 1.--Life stages of the Douglas-fir tussock moth.

A - Wingless female on cocoons.
B - Winged male newly emerged from cocoon.
C - Female ovipositing on cocoon - Note body hairs mixed with the newly laid eggs.
D - Full-grown larva, about 5 weeks old.